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JUDUL: **CRITICAL CAUSES FACTOR OF FALL ACCIDENT IN CONSTRUCTION SITE**

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CRITICAL CAUSES FACTOR OF FALL ACCIDENT IN CONSTRUCTION SITE

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A Report Submitted In
Partial Fulfilment of the Requirements for the Award of
Degree of Bachelor in Civil Engineering

Faculty of Civil Engineering and Earth Resources
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NOVEMBER 2010

I declare that this thesis entitled "**CRITICAL CAUSES FACTOR OF FALL ACCIDENT IN CONSTRUCTION SITE**" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : …….

Name : NORASIMA BINTI JAMALUDIN

Date : …….

"For my beloved parents, siblings, lecturers and friends…"

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ABSTRACT

The construction industries are a very dangerous environment which had a history of a relatively high number of injuries in comparison of other industries. Work at the high level has a tendency to involve in fall accident. Falls accident is one of the major leading causes of work facilities that occur to labor in the construction site. The aim of this study to investigate the safety problem in construction site, then identify the critical cause factor of fall accident in construction site, the solution and analysis the factors. The data was collected through interview, industrial visit,constructed and distiburted questionnaire in order to indentify the safety requirements in construction site. All of the interview and research questionnaire survey are conducted among contractor in company area Kuala Lumpur and Kuantan, Pahang. Returned questionnaire were analyses with average index to rank the factor of causes fall accident and frequency analysis method to identify the safety aspect in construction site. From the analysis find that unsafe behavior is the critical causes of fall accident in costruction site. In conclusion with existance of this study, it can boost up knowledge about safety and the company can be aware to prevent the fall accident from happen in the construction site.

ABSTRAK

Industri pembinaan adalah persekitaran yang sangat merbahaya yang mempunyai sejarah yang mempunyai nilai relatif angka kecederaan berbanding industri lain. Bekerja di tempat tinggi memiliki kecenderungan untuk terlibat dalam kemalangan jatuh. Kemalangan jatuh adalah salah satu punca utama kemudahan kerja yang berlaku kepada tenaga kerja dalam pembangunan. Objektif kajian ini untuk menyiasat masalah keselamatan di lokasi pembinaan, kemudian mengenalpasti kritis faktor penyebab kemalangan jatuh di tapak pembinaan,serta penyelesaiannya dan analisis faktor-faktor berikut. Data dikumpulkan melalui wawancara, lawatan industri, borang soal selidik untuk mengenal pasti keperluan keselamatan di lokasi pembinaan. Semua wawancara dan survei boring kaji selidik dilakukan di antara syarikat kontraktor di Kuala Lumpur dan Kuantan,Pahang.Borang soal selidik yang telah diisi,dianalisis dengan indeks untuk menentukan kedudukan faktor penyebab kemalangan jatuh dan kaedah analisis frekuensi untuk mengenalpasti aspek keselamatan dalam pembinaan.Rumusan bagi kajian ini mendapati,tingkah laku tidak selamat menjadi factor utama berlaku kemalangan jatuh dari tempat tinggi.Di dalam kajian ini, boleh meningkatkan pengetahuan tentang keselamatan dan syarikat boleh berhati-hati untuk mengelakkan kemalangan jatuh daripada berlaku di tapak pembinaan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The building construction industry plays a major role in the economy of the state of Malaysia. The construction industries are a very dangerous environment which has had a history of a relatively high number of injuries in comparison of other industries. In most countries, falls are one of the major leading causes of work facilities that occur to labor in the construction site. According to the Bureau of Labor Statistics (2002), the construction industry accounted for 20% of the workplace fatalities across all industry sectors in 2000, and 8.8% of the occupational injuries and illnesses. The fatality rate in construction is regularly exceeded only by the worker fatality rate in mining and agriculture.

Construction is often classified as a high risk industry because it has historically been plague with much higher and unacceptable injury rates when compared to other industries (Abd.Ghani Khalid, 1996). Sawach et.al, (1999) discussed various variables that influence safety on construction sites. The impacts of the historical, economical, psychological, technical, procedural, organizational and environmental issues are considered in terms of how these factors are linked with the level of site safety.

Construction accident does not only result in human injuries but also financial injuries. The accident not only terrible human tragedies but also substantial economic cost because accidents also cause legal cost, increased insurance premium damage plant and equipment. Any accident in construction site involves direct and indirect cost to a firm. The direct cost are those costs incurred as a direct result of a accident, including the cost of transportation the injured worker to the nearest medical facility, medical expanses wages paid to the injured worker, liability costs and damaged equipment and material. Indirect cost is any additional cost generated by the accident occurrence, investigation and cost hiring the temporary replacement (Hinze and Applegate, 1991). Fang et.al (2006) conducted a comprehensive safety climate questionnaire on all sites of a leading construction company and its subcontractors in Hong Kong.

The results of this study were then compared to previous research studies. The findings revealed significant statistical relationships between safety climate and personal characteristics, including safety knowledge, direct employer and individual safety behavior. Ultimately, these findings could provide useful information for construction managers and safety practitioners in the construction industry to improve their safety culture. According to a Business Round Table report (Construction Industry Institute, 1988).

The cost of an effective construction safety and health program in the USA is approximately 2.5% of direct labor costs. Successful safety programs have been developed by many construction companies and have shown remarkable results. Dupont's safety training and observation program achieved good results in reducing work-place accidents (Peyton and Rubio, 1991).

1.2 Background of problem

Accidents are the direct results of unsafe activities and conditions both can be controlled by management. Over the years, the construction industries reported the highest rates of work-related injuries and deaths. Occupational Safety and Health Administration (OSHA) has identified the top four causes of fatalities namely falls, being stuck by equipment or machineries, electrocution, and caught in between equipment. High-rise building can be classified when the Buildings between 75 feet (23 m) and 491 feet (150 m) high or more than 4 level are, by some standards. Evelyn et al., (2005) presented the results of a postal survey of contractors in Singapore.

The findings revealed that site accidents are more likely to happen when there are inadequate company policies, unsafe practices, and poor attitudes of construction personnel, poor management commitment and insufficient safety knowledge and training of workers. The study recommended that project managers must pay more attention regarding the factors identified above to help enhance safety performance on construction sites and reduce the frequency of accidents. The workers have the risk to involve in accident. Fall accident in construction not the rarely problem. It may happen everywhere and every time if we neglect the safety.

There have been several researches in the pass done concerning falls. Duncan and Benent in 1991 stated that there are two (2) measures are those that prevent the workers from fall an active and passive measure. Morris and Isaac (1980) defined falls as an up toward event in which the patient comes to rest unintentionally on the floor. Singh in 2000 investigated fall accidents occurring on low-rise roofs and evaluated some innovation fall protection measures. From the investigation concluded that no single method of fall prevention would prevent. However in Malaysia, the construction industry accident rates are not as high as in other countries but number of accident is still alarming.

Table 1.1 : Number of Construction Accidents and Construction Fatalities,

2000-2005(SOCSO Annual Report, 2005)

YEAR	2000	2001	2002	2003	2004	2005
Construction Accidents	4,873	4,593	5,015	4,654	4,445	3,150
Construction fatalities	159	89	88	95	81	77

OSHA also suggested several methods to control fall hazards, including elimination of or substitution for the operation that can lead to falls, use of engineering controls guard against falls, informing and reminding workers at risk to void fall hazards and appropriate use of personal protection equipment (PPE) (Huang and Hinze,2003). Bakri et al., 2006 stated that the one key success is by minimizing cost of project. Providing a safe and health workplace is one of the most effective strategies for holding down the cost of doing construction business.

Table 1.2: Cases of Accident in Construction Site, 2007

(Department of Occupational Safety and Health Annual Report, 2007)

	Date	Accident	Location
i.	21 Jan 2007	Fall from roof	Construction Site,Negeri Sembilan
ii.	12 Mar 2007	Fall from 7^{th} to 2^{nd} floor	Construction Site,Kuala Lumpur
iii.	28 Mar 2007	Fall of worker from platform of scaffolding	Construction Site,Melaka
iv.	02 Apr 2007	Fall from Height	Construction Site,Selangor
v.	14 Apr 2007	Fall from 6^{th} floor	Construction Site,Selangor
vi.	01 Jun 2007	Fall from 1^{st} floor	Construction Site.Selangor
vii.	20 Aug 2007	Fall from scaffolding	Construction Site,Negeri Sembilan
viii.	10 Oct 2007	Crushed to death by excavator	Logging Site,Sarawak
ix.	15 Oct 2007	Fall from lorry	Plantation,Pahang
x.	17 Dec 2007	Struck by flying rock	Construction Site,Perak

The accident will cause the injury and sometimes lost the life for workers and the negative effect is the construction will be stop for investigate causing delay to happen. The cost resulting from injuries and equipment damage, combined with the associated financial loss resulting from schedule disruptions, insurance hikes, and workers compensation, impact the profitability of any construction operation. These costs may be minimized or avoided through focused safety efforts on construction job sites. Kjoo-Jin and David (2006) considered the issue of safety risks on construction sites.

The authors stated that safety managers needed to be aware of the direct causes of accidents as well as the indirect factors that adversely affect on site safety. In addition, the authors presented a theory of safety planning method which estimated the risk distribution of a project and helped the safety manager to both estimate situations of concentrated risk and to reschedule them when necessary. The advancement in social science has promoted a greater awareness of the sanctity of life and the unacceptability of premature death due to accidents. Accidents at construction sites are identified as a major problem throughout the world. So, the accident report is very important for the industry to investigate and prevent reoccurrence of the accident.

1.3 Problem statement

In the construction project, money is the important thing. To get the success project, we must consider on quality, time and cost. All three main points are related with safety. If safety is negligible, it may affect the time of completing the project, and also can increasing the cost. Of course the quality of the company and project cannot be maintained. Accident will be happen if worker and the company did not follow the safety regulation. Fall accident is one of the factors increasing the construction fatalities nowadays. If fall accident happens, it may influence the injuries or die, the cost and the company reputation. This problem will always increasing if all parties did not together to reduce the number of cases. The company needs to identify the causes of the fall accident. Therefore, the objectives for this study are to investigate the safety problem in construction site and identify the critical factor of fall accident and the solution also analysis the causes of fall accident.

1.4 Objectives

The aim of this study is to provide general perspectives of safety in construction site. The specific objectives of this study are:-

i. To investigate the safety problem in construction site especially who work at the high place.

ii. To identifies the factor of cause fall accident in construction site and the solution.

iii. To analysis the factor that influences the accident and the precaution steps.

1.5 Scope of study

Scope of this study is focused on safety in construction site, the safety problem and the solution. This research project focuses on high-rise building, high place where activities are being carried out under private and government department. The companies will be involved for this study is around Kuala Lumpur and Kuantan,Pahang.

1.6 Methodology

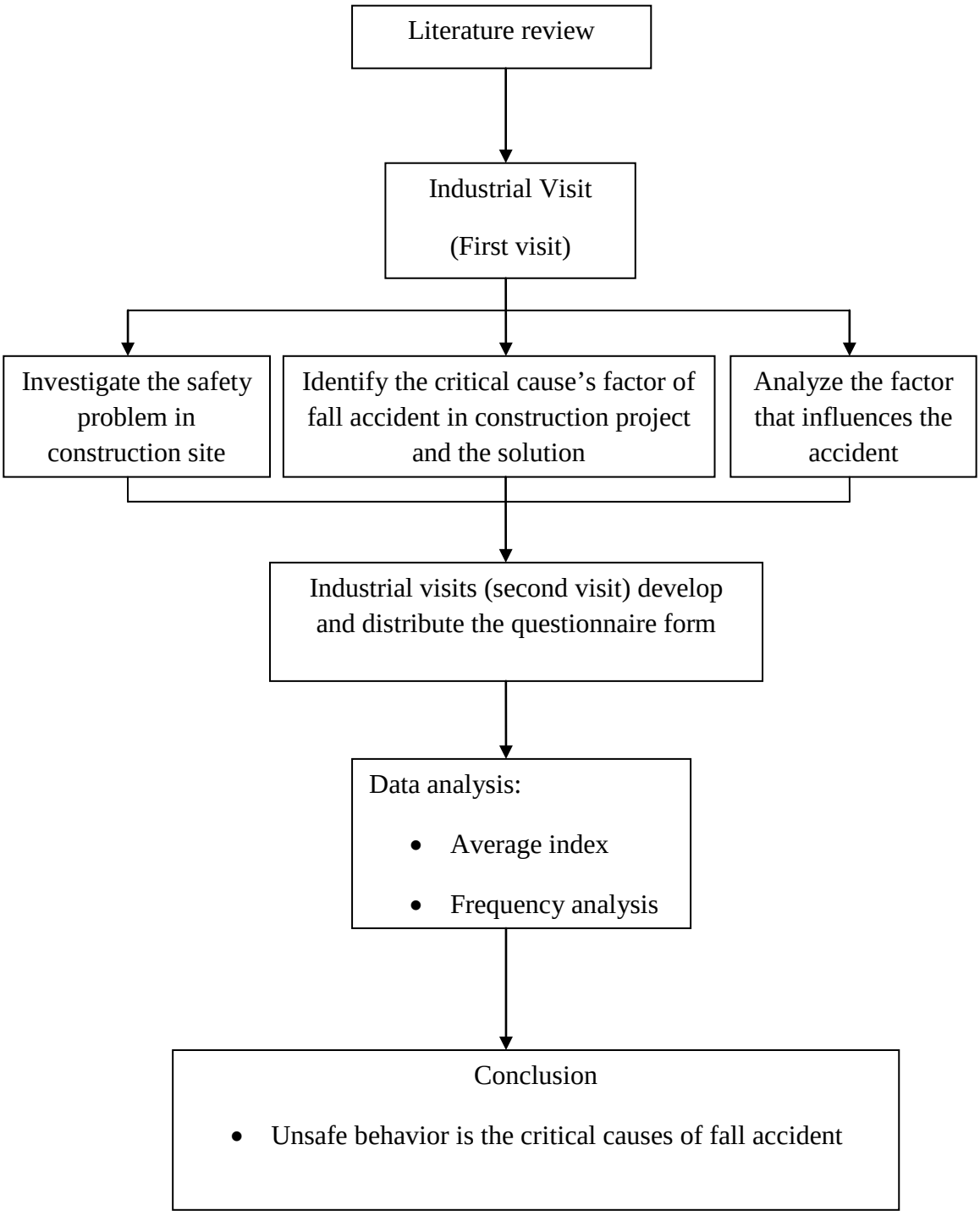

Figure 1.1: Summarized of Methodology

Figure 1.1 shows the summarized of this project. It is important to fulfill the objectives. For this research, it starts with the literature review from the journal, news, books and others. For the first industrial visit functional as to survey the site and company's project. Set of questionnaire can distribute during this visit. For this industrial visit, safety problem in construction site can be investigate, the critical causes factor of fall accident can be identify. For the second industrial visit is important to collect all the set of questionnaire for analyze. All the questionnaire will be analyze using average index and frequency analysis. After done analyze all the questionnaire, conclusion will be obtain.

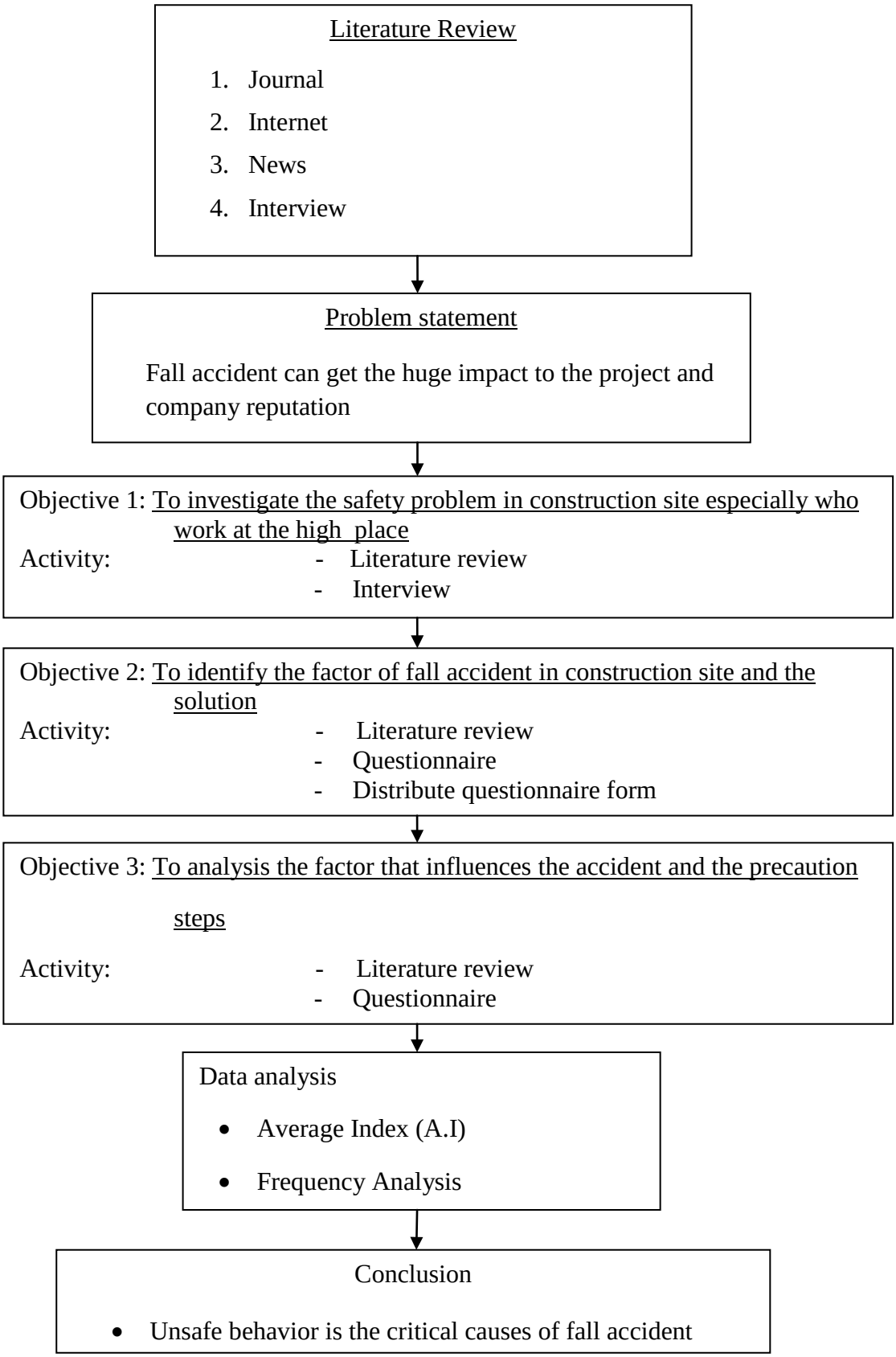

Figure 1.2: Flow chart of Methodology

1.7 Significant of study

The successful construction project can be determine by four aspect; time, cost, quality and safety. Without money, the project cannot complete in a due date. Safety can make the same impact with the money. If accident happen, it may disturb the time of project, it may delay some a few day or a month. It may increase the cost, besides; the quality of management will be decrease. So, from this study will help to measure the safety in a construction project. Besides, the management can be provide the precaution step and try to avoid an accident. As a result, the statistic of accident can be decreasing and the quality of project can be maintain and complete on the time.

1.8 Expected Outcome

At the end of this course, the management would be able to apply and used the suggestion precaution step to prevent an accident. The workers and the contractor can be understand safety aspect and follow the rule.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Fall from buildings and other fixed structures have focused on the construction site. Nowadays, to minimize the area for the construction, all project managers take the opportunity to built high-rise building. It also suitable for our country which is did not have earthquake and four seasons. In this chapter, there are several part will be discussed which are Occupational Safety and Health Act (OSHA), types of falls accident and the causes of the fall accident. OSHA has identified the top four causes of fatalities namely falls being struck by equipment or machinery, electrocution and caught in between equipment (US Department of Labor, 2008).Construction industry in Malaysia have been identified as one of the most hazardous activities. Awang (2007) reported out of 73858 industrial accidents recorded in 2003, while 4654 accidents were come from the construction industry where 2.0 % or 95 cases resulted in death.

Figure 2.1 shows the number of accidents reported to Social Security Organization (SOCSO) from 1993 to 2003 whilst Figure 2.2 shows the number of fatalities in construction industries for the same period.

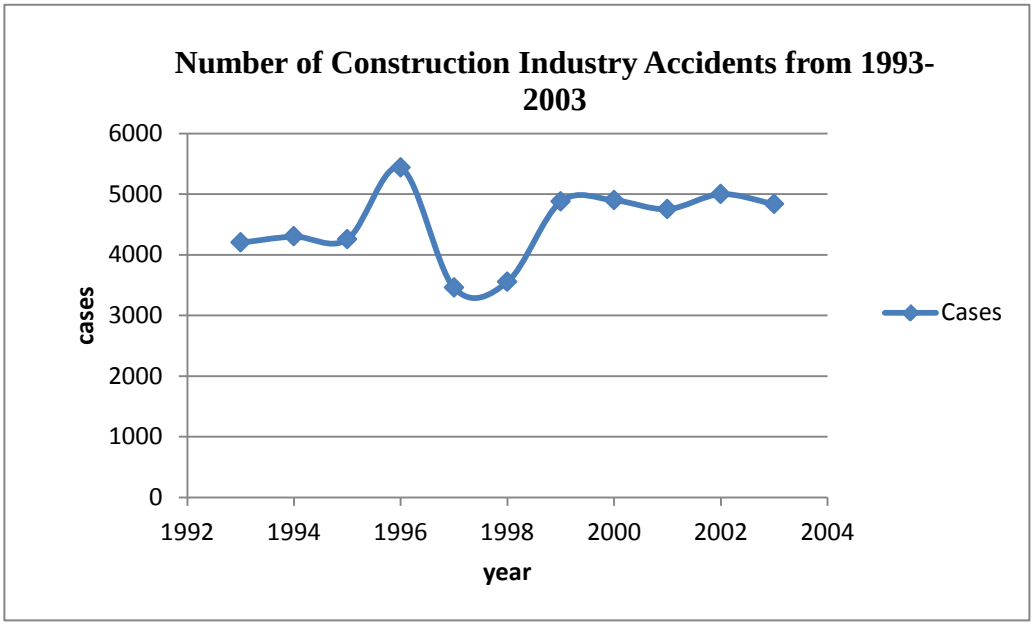

Figure 2.1: Number of Construction Industry Accidents from 1993-2003 (*Awang, 2007*)

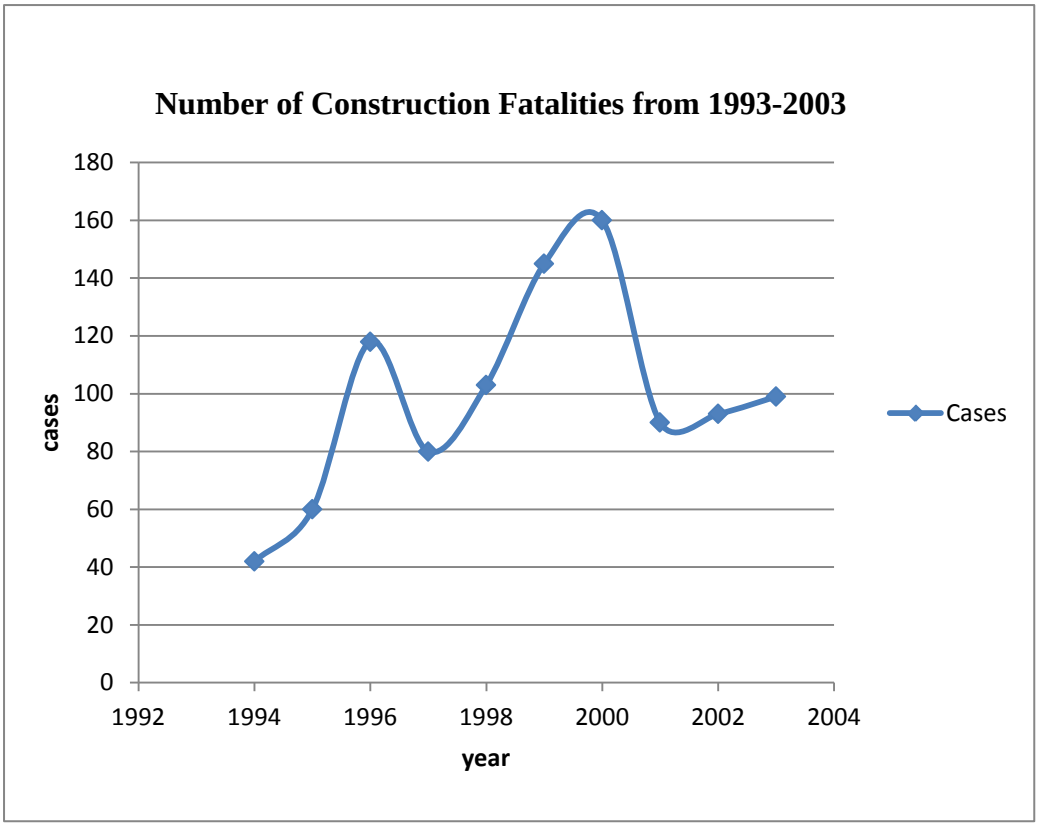

Figure 2.2: Number of Construction Fatalities from 1993-2003 *(Awang, 2007)*

The common source of fatalities in recent years has been injury,acounting for almost one-third of the total.Following the introduction of the construction (Head Protection) Regulation on 1 April 1990,in most years,at least 40 % of all construction have been falls from height.

Table 2.1: Fatal falls to employee in construction industry over 9 years *(Sawacha,1999)*

Year	Falls	All Employee fatalities	Fall as % of fatalities
1991	45	96	46.88
1992	37	83	44.58
1993	27	69	39.13
1994	35	73	47.95
1995	24	56	42.86
1996	21	62	33.87
1997	33	66	50
1998	29	58	50

Table 2.1 shows fatal falls to employee in construction industry over 9 years from Sawacha,1999.Falls as a percentage of total fatalities has been remarkably constant over past years,justifying the attention givenn to fall protection in its own right in Construction Regulation.In 1999 , the percentage of the falls in the ‘non.fatal majot injury’ category was 37% with an additional 21% as falls from the same level (slips,trips and falls); 35 % of reportable, over 3 day injuries in the industry were due to manual handling. To identified the causes of the fall accident and prevention action are must to minimize the number of fall acident.

2.2 Occupational Safety and Health Act (OSH Act)

The Occupational Safety and Health Act (OSH) 1994 it's a regulations aim to secure the safety, health and welfare of persons at work, to protect others against risk to safety or health in connection with the activities of persons at work, and to promote an occupational environment for persons at work which is adapted to their physiological and psychological needs

2.3 OSH Act Agencies

OSH Act established three different agencies: The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Review Commission (OSHRC)

2.4 Function of The Occupational Safety and Health Administration (OSHA)

2.4.1 Management of workplace occupational health risks.

The Occupational Safety and Health Administration (OSHA) are needed to identification and assessment of workplace hazards. It is involves identifying, anticipating, examining, and evaluating the workplace environment.

Hazards are including chemical, physical, biological, ergonomics and psycho-social. OSHA need to:-

i. Review of projects, designs, and purchase to anticipate hazards;

ii. Identify workplace health hazards and understand their effects on people and their well being;

iii. Assess human exposures to hazards through combination of qualitative and quantitative methods to determine level of risks; and

iv. Determining the need for, appropriateness, of biological monitoring in risk assessment.

The Occupational Safety and Health Administration (OSHA) also have a responsible to measure the risk communication which is communicating risks and control measures to workers, management, and other stakeholders. Some of the activities here include awareness program, workers' training, community awareness, etc.

2.4.2 Management of Workers' Health.

The Occupational Safety and Health Administration (OSHA) needs to manage the workers' health. OSHA has a responsible to remind the employment to do the medical examination to the workers. This examination should be conducted to assess whether they are fit to work.

Pre-placement medical examinations are performed for all employees who are new or transferred to jobs with special requirements;

i. to provide an evaluation of an employee's health status to ensure he/she is physically and mentally fit to perform the job and/ or to wear the Personal Protective Equipment provided

ii. to establish a baseline record of physical condition which later can be very important for stating if a health impairment had already existed before employment or if it could have been caused by workplace.

iii. to detect physical defects or disease which may be treated at an early stage

Furthermore, The Occupational Safety and Health Administration (OSHA) need to ensure the employer do a health promotion to provide the workers and employers information about the hazards at the workplace. In this way, both the workers and employers can work together to minimize these health hazards by implementing work improvements. Efforts to help workers make modifications to their lifestyle (e.g. smoking cessation; healthy eating; exercise; weight control, etc.) are included in this activity

2.4.3 Participating in emergency response and disaster management.

The Occupational Safety and Health Administration (OSHA) always observe the employer to participate in emergency response and disaster management. It is important because, if the accident happens, the worker will know what they will do because they are involving the whole worksite. Some of the examples of the accident are fire, explosion, leak and others. Appropriate training in first aid has to be organized for employees to ensure that they are competent to provide appropriate care in an emergency

2.4.4 Provision of clinical services

Although the occupational health service is mainly preventive in nature, there may be a need to provide some clinical services in the event that the condition is Amenable to treatment and the facilities are available

2.4.5 Record keeping.

Record keeping is the data that always keep at the safe place. It is important as a data, references and evidence if something happen on site. The Occupational Safety and Health Administration (OSHA) needs to ensure the employer always update the record keeping. The most common data collected is that of number of cases of work related injuries, occupational poisoning or occupational diseases reported in a specified period, usually in a calendar year. All the data need to be analyzed to look for trends and whether there are any vulnerable groups within the workplace. Any work-related injuries occupational poisonings or occupational diseases shall be recorded and reported to Department of Occupational Safety and Health (DOSH).

2.5 Types of fall accident

2.5.1 Excavation

Excavation is a process which can be done in two ways, namely manual and use machineries. Using Manual way to excavate the hole, there are need a lot of workers but using machineries it is easy and done in the short time. The machineries that will involve are backhoe, excavator and others. It is surgery of the buried landscape and is carried out with all the skilled craftsmanship that has been built up with the sequence method. Fall into the excavation is the common accident (Earl S.P, 2001). For every site, for sure the excavation process will be conducted; this is because, usually excavation work happening for excavating the hole for foundation.

Figure 2.3: Excavation (*http:/en.wikipedia.org/wiki/Excavation)*

From the pFigure 2.3 is one of the situations that fall into excavation will happen. For the excavation work, the person who involve need to wearing the personal protection equipment such safety boot, safety belt and helmet. General accident cause by excavation is workers trapped in excavation or stuck and injured by materials falling into the excavation. Other accident is workers falling into the excavation. (Hatipkarasulu,Y and Sunkara, 2007). Employer also need to ensure the in that area are provided the net and free from hazards. The basic control measures for excavation is the sides of excavation likely to collapse must be supported, where the flooding exists, pump, cofferdams and caissons will be needed.

2.5.2 Scaffolding

In the construction industry perhaps the most common way of providing a place to carry out work at a height is by means of a scaffold (Telford, 1992). Scaffolding can cause of fall accident if the workers neglect to wear personal protection equipment for example, did not wearing a safety belt during climbing the scaffolding. Telford, 2009 stated that the main hazards associated with scaffolding are:-

i. People falling from the working platform

ii. People below the working platform being struck by material falling or being thrown from it

iii. The scaffolds, or a part of it, collapsing and throwing people from the platform or the collapsed structure crushing people under it or nearby at ground level

Figure 2.4: Work using Scaffolding *(http://en.wikipedia.org/wiki/Scaffolding)*

The worker sometimes lose their balance at working platform level because of they are slip, trip, stumble or on very rare occasion are taken ill. The presence some aspect can prevent a fall. Fall arrest equipment will normally be relied upon, using a suitable anchor point when working 4m unless within protection of a single guardrail and platform three boards wide (Permana, I.E, 2007). Scaffolding is not the strong structure, this is because it is not a permanent structure it be opened and re-installed. So, possibility to collapse is high. When using the scaffolding, we need to join the scaffolding with the connector to make the scaffolding become stronger. Tie-off (anchorage) point on scaffold tubing is acceptable provided that the scaffold is tied in to a structure and that tie-off is made horizontal members only.

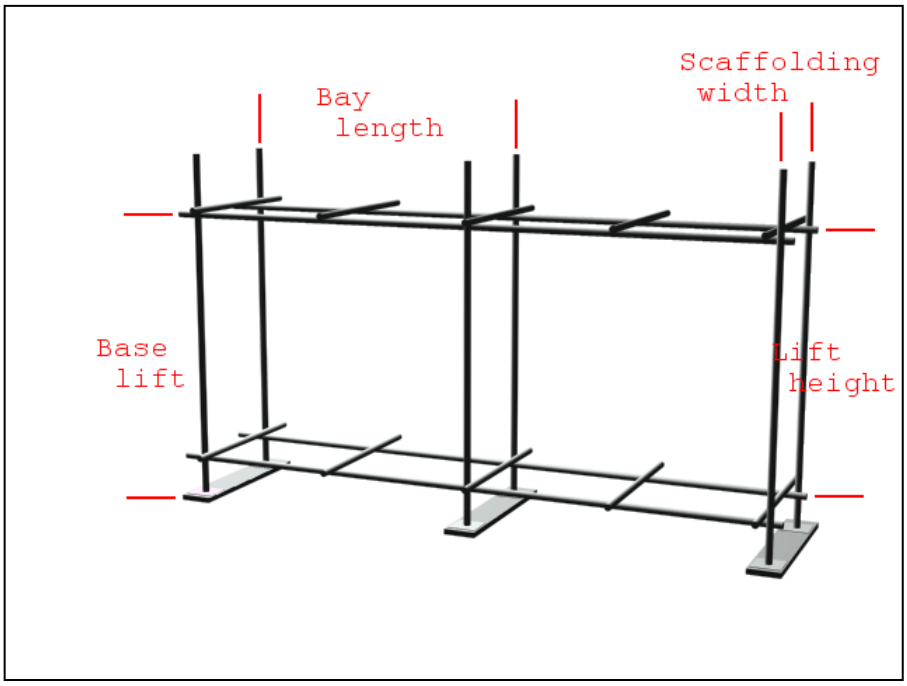

Figure 2.5 : Basic Scaffolding term without board, bracing and coupler *(http://en.wikipedia.org/wiki/Scaffolding)*

2.5.3 Ladder

A ladder is a vertical or inclined set of rungs or steps. There are two types: rigid ladders that can be leaned against a vertical surface such as a wall, and rope ladders that are hung from the top. The vertical members of a rigid ladder are called stringers or stiles. Rigid ladders are usually portable, but some types are permanently fixed to buildings. Usually ladder use for installing the cable at the electric pole. Ladder can be one of the things that can causes of fall accident if the worker did not personal protection equipment such as safety belt.

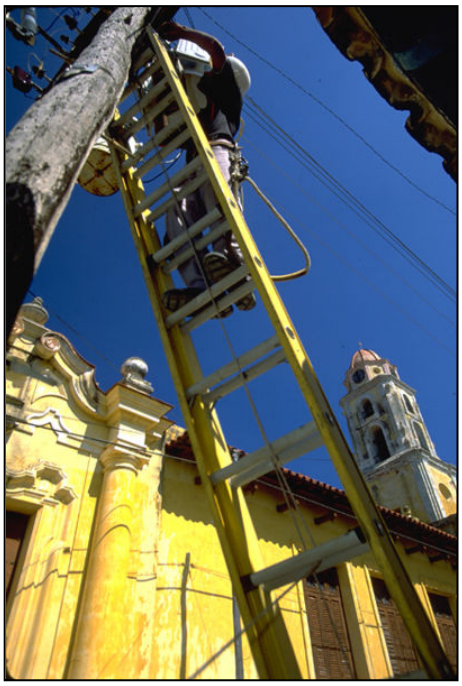

Figure 2.6: Work using the ladder (*http://en.wikipedia.org/wiki/Ladder)*

From the Figure 2.6, the workers use a ladder to work at the high level. Ladder accidents usually are caused by improper selection, care or use, not by manufacturing defects (King, 1985). Some of the more common hazards involving ladders, such as instability, electrical shock, and falls, can be predicted and prevented. Prevention requires proper planning, correct ladder selection, good work procedures and adequate ladder maintenance.

2.5.4 Roof Work

Roof work is work at the top of the building. Roof work is high-risk activity. According to the Health and Safety Executive (HSE) guidance booklet Safety in roof work, almost one in five of all construction deaths occur in roof work. Working at the roof is most dangerous compare to other part of works for building construction. Without proper precaution, workers are exposed to fall to ground and suffering a serious injury. Accident can occur related with roof are:-

i. through gaps or holes in roofs;

ii. Through fragile roof materials and roof lights

iii. Fall while gaining access such as a ladder slipping while weight is being transferred from step-off rung to the roof

iv. Falls from exposed edges because of leading edges is difficult to protect as their extent and location are often changing rapidly.

v. Falls while walking on covered or open purlins and on ridges.

In addition, many people have been seriously injured by material falling or thrown from roofs. Accidents don't just happen to those building roofs, but also to people maintaining, cleaning, demolishing and inspecting them. Any work on a roof is high risk because it involves work at height. High safety standards are essential however long or short term the work is. The nature of the precautions needed may vary from one job to another. To undertake roof work safely, it is necessary for workers to have knowledge and experience working on roof. Safe access to the roof will generally be by ladder.

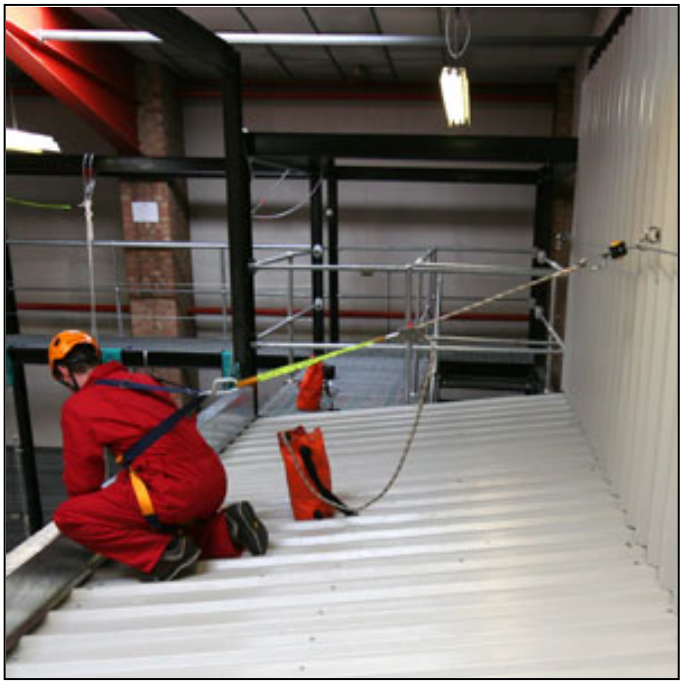

Figure2.7: The right way during roof work

(*http://www.flickr.com/photos/charee/86459329/)*

2.5.5 Crane

Cranes is the machine that is used in every work place where heavy materials are needed to be transported from one place to the other. It is a machine which has a wire rope which performs the action of lifting and moving heavy materials from one place to the other. To handle the crane, it needed the workers who have expertise about handling the crane. The accident occurs when loading is accidentally dropped and hit a person below. Other cause is by misunderstood to the signal given by workers.

Furthermore, crane can cause:-

i. Overturning because of weak support, operating outside the machine's capabilities and by striking obstruction

ii. Overloading by exceeding the operating capacity by failure of safety Devices

iii. Collision with other cranes, overhead cables or structures

iv. Failure of support when placing over cellars and drains, outriggers not extended made-up or not solid groundwork failure of structural components of the crane.

Figure 2.8: Crane operation in the construction site (*http://thecrane.com.my/)*

2.6 Causes of fall accident

Permana, (2007) had mentioned that the major symptoms such as unsafe practice and condition would be impossible to eliminate by human or people. But having the knowledge on safe act can be consideration as a good safety practice and safe condition exist during construction period. Morris and Isaac (1980) defined fall as an untoward event in which the patient comes to rest unintentionally on the floor. Haslam and Stubbs (2006) investigated fall accident occurring on low-rise roofs and evaluated some innovative fall protection measures. They conducted that no single method to fall prevention would prevent all falls on low-rise roofs, but determined that prefabrication was the most promising method, followed closely by personal fall arrest system (PYAS) and it's variant. The Occupational Safety and Health Administration (OSHA) also suggested several methods to control fall hazards, including elimination of or substitution for the operation that can lead to falls, use of engineering controls to guard against falls, informing and reminding workers at risk to avoid hazards. For this study the causes of fall accident can be categories for three parts which are unsafe behavior, unsafe practice and unsafe workplace condition.

2.6.1 Unsafe behavior

Unsafe behavior are often referred to as immediate or primary causes of accidents, because they are the most obvious causes and because they are usually directly involved or present at the moment the accident happens. Unsafe behavior can refer to the workers and also to the employer. Thanet Aksorn, (2007) stated that unsafe behavior of workers is considered as major contributor of work related accident and injuries on construction site.

Table2.2: Summary of Various Researcher

Author	Description
Abdelhamid,(2000)	Working without authority on the job can cause accident.
Thanet Aksorn, (2007)	Failure to warn or to secure worker out of danger
Anton(1989)	Ignoring to wear personal protection equipment (PPE) may increase chances to getting injured
Tam et al., (2004)	He noticed that cause of accident due poor safety awareness from top leader, lack of training poor safety awareness of project manager, lack of certified skill labor and lack of organizational commitment.
Michuad (1995)	Workers who use drugs and alcohol have the tendency to distort or block their decision-making capability.

Abdelhamid, (2000) stated that when the worker working without authority on the job, it can cause an accident. This is because since unauthorized workers may lack the necessary skills or unfamiliar with the job process. Unauthorized worker are not register and they did not attend any class related with safety or job process. Training programs helped personnel carry out various activities effectively, establish a positive safety attitude, and integrate safety with the construction and quality goals. In fact, the percentage of construction workers being trained is very low in China.

Statistic reveal that only 3% of workers have been trained and certified,7% trained under short-term programs whilst 90% are without any training at all (Zhang,2001). When the employer gives a work to the unauthorized workers, they will try to do it using any kind of method until it complete. Sometimes, the methods that they use have a potential to involve in accident.

Besides that, lack of teamwork spirit among the worker can be classified as unsafe behavior. In construction site, each employee is not an individual, but a member of group as well (Strank, 1994).Each group has its own norms, set its own work goals, moral standards and make its own decisions. The norms also incorporate the behavior of workers towards their boss and how workers react towards safety regulations. Kittleson (1995) stated that it is easier for the workers to base their behavior on others than to do the right thing. When someone can detect the hazards, he or she needs to inform to the others. But if they did not have teamwork spirit, maybe other person can involve into an accident. Failure to warn or to secure members out of danger is consider as unsafe behavior. Since many accidents occur because workers pay less attention to warning or securing co-workers who are working under condition with high probability of accident occurrence (Thanet Aksorn, 2007)

During in construction site, all the person must in that area must wearing personal protection equipment (PPE) such as safety boot, safety helmet, and proper attire. Anton (1989) stated that ignoring to wear PPE may increase chances of getting injured. For an example, Greenberg et.al stated that PPE can be uncomfortable, can decrease work performance and can create new health and safety hazards. Some workers for instance, reject to wearing of earmuff because it makes them fell hot, especially when it is used in hot region. It is one of the reasons why the workers did wearing PPE.

Other than that, workers who use drugs and alcohol have the tendency to distort or block their decision-making capability (Michuad, 1995).In general, experimental research has shown that alcohol has a delirious effect on performance due to its effects on judgement, reasoning and memory. Drug users and drinkers often experience reduced levels unawareness, a situation which could lead to decision errors and unsafe working. When the influence of the drug or alcohol is over, a worker might wonder why he did the unsafe behavior. The employee need to observe the workers properly if want to decreasing the accident on construction site.

2.6.2 Unsafe practice

Unsafe practice can be one of the causes of fall accident. It is referring to the workers themselves. Workers are the person who involved in the construction project from the beginning until completed the project. Howell et al. (1998) noticed that unsafe practices are often seen in every construction project all over the world. In construction, it is suggested that unsafe practice is the most significant factor in the cause of the site accident (Sawacha et al.1999).

Abdelhamid and Everett, 2000 stated that no general agreement on definition of an unsafe practice. However, it has been defined in similar focus accepted practices which have potential for producing future accidents and injuries. For example, Starnks (2000) gave the definition on unsafe practice as "… any act that deviates from generally recognized safe way of doing a job and increases the likelihood of an accident…." Several unsafe practice have been identified by many researcher such as Stranks (1989),Abdelhamid and Everett (2000) and others.

Table 2.3: Summary of Various Researchers

Author	Description
Abdelhamid and Everett (2000)	Working at improper speeds, exceeding the prescribed speed limit or unsafe speed actions could cause accidents
Suraji et al., (2001)	Improper lifting, handling or moving of object may cause serious back pains.
Holt (2001)	Improper placing and stacking of object and materials in dangerous location can result in unpredicted accident
Nunnally (1978)	Incorrect use of tools and equipment, hand tools, power tools and machinery can cause accident.
Stice,M.(1995)	Annoyance and horseplay in the workplace can be cause of accident

Abdelhamid and Everett (2000) conducted a more comprehensive study in the United State and classified the causes into human and physical factors. Human physical factor is due to operating at unsafe speed. For the workers who working at the improper speed exceeding prescribed speed limits or unsafe speed actions could cause accidents. Workers who handle objects quickly could slip and be injured. Speed action can be causes of time pressure. Stice(1995) stated that pressure from supervisors to get jobs done quickly can cause unsafe speeds action. As results of such pressure, workers may disregard good safety practices to save time for completing the jobs. Pressure from the employee can produced stress. Stress has been defined as human's reaction against a threatening situation (Geotsch, 2005).

According to Greenberg and Baron (2000), there are two different forms of work overload: quantitative overload, which occurs when individuals are asked to do more and qualitative overload, which refer to employees' belief that they lack of the required skills or abilities to perform the work. So, the employee has a responsibility to control the speed limits of the worker.

In the construction site, there a lots of activities can be involve including the lifting or transfer material such as the worker who bringing the trolleys contain of brick or others material. Suraji et al., (2001) stated that improper lifting, handling or moving of objects may cause serious back pain. The workers who use improper step like manually lift heavy objects without proper force-saving equipment have a potential to involve in accident. Also, the workers are usually unaware of the safe methods for handling the objects. For the prevention step, worker should use proper method to handling object or others.

Furthermore, improper placing and stacking of objects and materials in a dangerous location can result unpredicted accident (Holt, 2001). From the unsafe practice can affect to the others worker such collide with such objects. Other than that, leaving nails or sharp objects in dangerous location can consider as improper placing. Sharp object protruding from timber may cause accidents as workers who do not wear safety shoes could step on these objects and be injured. Type of unsafe act can be interpreted as an occasional degree. By observing the workers' practice, it is very easy to see that they do not pay attention to keeping sharp objects properly in the basket provided.

Nunnally, (1978) noticed that incorrect use of tools and equipment, hand tools, power tools and machinery can also cause accident. For instance, workers who frequently climb or stand on rebar's instead of using a ladder could fall down. Using substandard ladder also can cause fall and be injured. Besides, throwing or dropping objects from high level did not using the correct ways could expose other works to sustaining possible head injury. Improper posture for tasks such as workers taking shortcuts by climbing or jumping from high levels instead of using ladder can be classified as incorrect use of equipment. For the worker who handling machinery can involved in incorrect ways of machinery.

When refueling the fuel in the machinery tank without first turning off the engine could cause a severe accident like fire. It becomes worst when smoking at the construction site. This is because, it creating naked flame or sparks in area where flammable materials are store could causes explosion.

Unsafe practice can be found in the construction site. It is causes by the worker who annoyance and horseplay in the workplace such as young workers who play roughly around the workplace could encounter unexpected accidents. The dangerous place far horseplay is on the scaffolding or the ladder (Stice, M.1995). According to the Simachokdee (1994), horseplay with each other can be able to release tired.But, it must consider to the level appropriate to the place and circumstances. During in the construction site is not the suitable place to playing around.

2.6.3 Unsafe workplace condition

Workplace condition is one of the causes of accident. Pernama (2007) stated that policy and safety procedure sometimes do not eliminate accidents but unsafe conditions could be the one that causes accident to occur. Tools and equipment are essential in the construction industry. According to Ridley (1986), 99% of the accidents are caused by either unsafe act or unsafe conditions. The unsafe condition is hazardous physical condition or circumstances which could

directly permit the occurrence of an accident. Kartam and Bouz (1998) did a study in Kuwaiti construction and noted that he causes of accident were due to improper cleaning and unusable materials, and poor accident record keeping. Abdelhamid and Everett (2000) proposed that accidents in construction occur due to three root causes. One of them is failing to identify an unsafe workplace condition that existed before an activity was started or that developed after an activity was started. The client response will provide many of the constraint. This cause and effect process has the potential to increase operative constraints directly or indirectly through inappropriate construction planning or inappropriate control procedures, lead to inappropriate site conditions (Suraji et al, 2001)

Table 2.4: Summary of Various Researchers

Author	Description
Har einur Azrin BAharudin et al., (2003)	Falls accidents caused by tool and equipment include use unsafe tools and due to mechanical failure
Schriver (1997)	The accident causes by missing platform guardrail and in adequate scaffolding.
Thanet Aksorn and B.H.W Hadikusumo (2007)	Ineffective housekeeping apply in the construction site can be one of the unsafe workplace condition.
Xinyu Huang and Jimmie Hinze (2003)	Lack of supervision and testing tool and equipment by the management can cause of fall accident.
Huang et al., (2003)	Did not provide the good condition of personal protection equipment

They may be small as compared to plants and machineries but their role is just as important failure to these support-related structures such as ladder may cause fall accidents. If one of the important structures collapses then this will cause the support causing the employee to fall. In Malaysia, there have been number of fall accident and some causes of fall accidents are due to tools and equipment condition. It was stated in The New Straits On January 15, 1997 that in Damansara two foreign workers fell to their death due to the platform collapse. This was then repeated on March 6, 2007 when a worker also fell to his death due to a failure in the structure too. On March 12, 2007 in Kuala Lumpur a worker fell and died due to falling from a gondola .Then on April 2, 2008, in Kuala Lumpur three Indonesian workers fell to their death when a gondola they were working tilted and slipped (Har einur Azrin Baharudin et al, 2003).

Follows Schriver (1997), findings which indicate fall from roof is the most common cause of fatality in construction site. The important equipment for work at the high level is scaffolding. The safe scaffolding is containing the guardrail, toe and it adequate. But the accident can happen when the scaffolding did not have guardrail, lack of edge protection and others. It is become worst when the worker who work on the scaffolding did not wearing a safety belt. Inadequate scaffolds can have a tendency to collapse or turn over. Furthermore, removing safety guards from the workplace or equipment could raise the chances of fall downs.

From the Thanet Aksorn and B.H.W Hadikusumo (2007) studied, the rate of accident and fatalities in Thai Construction is reported as the highest. In 2003, the construction industry accounts for 14% of the total number of 787 deaths at work and 24% of the total 17 cases permanent disability. For the many years, safety practitioners have addressed physical preventive measures such as housekeeping. After completing the worker, the worker should take around an hour to cleaning the workplace area. It is important to ensure the level of safety in the workplace always in the high safety level.

Employees should not just be aware of the other employees but they must be aware of their movement. Failure to ensure the site in clean and free from hazards can lead to accident. If the site is muddy and slippery this may cause employees to slip, trip and then fall.

Besides that, lack of inspection and testing can consider as unsafe workplace condition. According to the Xinyu Huang and Jimmie Hinze (2003), management has to ensure that all the employees are regularly checked so the employees follow the rules and the regulations of the company's safety policy. Employees are less concern regarding safety as some safety procedure such as wearing safety belts and safety harness can just slow down their work. Therefore supervision is important. Supervision is also essential as employee who are eager to finish their work early may act reckless like using boxes or chairs to act a ladders, moving ladder while still on the ladder so to speed work. Lack of testing the tools and equipment such a ladder all can cause of fall accident. This is because these tools and equipment are things that have to be inspected. Old wooden ladders may crack or break while employees are working. Xinyu Huang and Jimmie Hinze (2003) also stated that 'removal of safety devices" is also a leading cause of fall accidents.

Personal protection equipment is important during in the construction site. The types of PPE have different functions, including hearing protection, eye protection, respiratory protection, proactive clothing, safety helmet and harness. But not all employer provide the PPE to their workers.PPE is important to protect the worker from involve an accident. Providing the old PPE is one of the wrong ways. Harness will provided when the workers work at the high level. If the harness cannot be function and use for the long time, it can decreasing the strength of the harness.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology adopted in this research. A carefully and throughly planning and scheduling has been organized on the methodology. This is to ensure proper sequence for a smooth running of the study started from literature review, interview, site visit to site construction, and questionnaire survey, data collection, data analysis and lastly the discussion of the result, suggestion and conclusion. This chapter is important as it described the methodology which is designed in achieving the research objective which are to investigate the safety problem in construction site especially who work at the high place, to identify the factor of fall accident in construction site and the solution and to analysis the factor that influences the accident and the precaution steps. In general, this study will be distributing the questionnaire and also interview by the respondent from a few construction sites situated in Kuala Lumpur and Kuantan, Pahang were selected as research study.

Firstly, to achieve the first objective, interview was carried out with a person who involve in construction work. It was carried out in order to identify the safety problem in the construction site especially work the high place in construction sites. Secondly, questionnaire survey was done in order to identify the causes of fall accident in the construction site and the solution for decreasing the number of accident reporting. Thirdly, data analysis are using for analyze the causes factor of fall accident and the solution. The approach adopted and the methods of data collection selected will depend on the nature of the inquiry and the type of information required (Judith, 1999).

3.2 Research Design

This research was conducted by distributing a set of the questionnaire to the persons who involve in the construction site located around Selangor. Collecting data from various people within some construction companies will be carried out using questionnaires for this research. Questionnaire uses introspection principles since it is basically a self-report that provides information of past, present or future conditions that guide respondent of certain population. Using the questionnaire enables to collect data faster and cheaper than other instrument.

Before focus the method use for this study, it is important to know the problem and background of the study. Problem and background of study can be determined by doing some research from journal, book, news and internet. From the topic selection which is critical causes of fall accident it can give a lot of impact to the construction project. The problem that related with these topics is when neglect the safety in construction site, the accident may obtain.

Accident may cause injuries and death, construction delays, productivity losses, gives the direct and indirect impact to the construction project. Some of causes an accident are poor safety awareness, lack of training for the new workers, careless, poor record keeping, did not know how to handling the equipment, and the behavior of the workers and the employer.

From this problem, objective for this study can be determined, to investigate the safety problem in construction site especially who work at the high place, to identify the factor of fall accident in construction site and the solution and to analysis the factor that influences the accident and the precaution steps. To make the research become smooth, the outline of this scope of study need to determined. The first way, use the interview method. Besides that, distributed the questionnaire and analyze the data collection.

All this step need to organize properly by using schedule. For this semester, completing the chapter 1 until chapter 3 is compulsory. The next step is preparing the questionnaire to distribute to the respondent. For the future semester, analyze the data collection and completing the thesis. After that, establish the literature review, methodology and the references. Further, the implementations of the research methodology explained earlier are described in Chapter 4 and 5. It is all important to make this research successful according to the schedule planning.

3.2.1 Literature Review

Literature review is important to help narrowing the topic by providing a sense of direction. In order to be able to make an original contribution to knowledge in the research area, the literature review had demonstrated a comprehensive grasp of existing knowledge. The literature review served two purposes. Firstly, the literature review helped in systematic reading of previously published and unpublished information relating to types of fall accident, critical causes of accident in the construction site and the solution for this problem. Secondly, the literature review assisted in improving the research and gave some insights into how to design the study more effectively. It has to provide a basis idea and fundamental for the research.

The earlier stage of literature reviews within this study was obtained from journals, scientific books, data and previous research from government institution, decrees in reference to safety practices. Literature reviews are conducted on the previous studies all over the world concerning safety problem, safety practices and safety improvement. This is to get some clues, differences and similarity among the scientific judgments.

For this study, the purpose of literature review is to focus in safety at construction site, the types of fall accident and the causes of fall accidents. Redzuan (2006), highlighted than the mass of literature physicals imposed to read, let alone assimilate. Furthermore, it’s too much information can cause over saturation. This may lead reduce possibility of developing new perspective. The information obtained is systematically transferred into notes, table and diagram and some of the information is printed as hard copy for future references. Therefore, in the construction site, safety is the important thing to take an action and always sensitive about it. So from this literature review will used as a reference to do the questionnaire.

3.2.2 Industrial Visit (Site Visit)

Purpose of site visit is to know safety aspect at the construction site. To see whether the workers at the construction site apply the safety rule and wearing the personal protection equipment, so that site visit was doing. For industrial visit, it is done with two visits. First visit get information about problem of safety aspect at site construction. It is important for achieving the first objective which is to investigate the safety problem in construction site especially who work at the high place. Then, for seconds visit are to distribute that questionnaire to use for data analysis. All information was get from this visit were used to develop and distributes questionnaire. Therefore, site visit, were doing at are Kuala Lumpur and Kuantan.

3.2.3 Interview

In order to identify the problem in the safety aspect in the research study, interview method was used. This is a face to face interpersonal role situation in which an interviewer asks respondents questions designed to elicit answers pertinent to the objective. Koentjaraningrat (1994), explains about the interview method as a method includes the way to get the information or statement orally from a respondent, by having a face-to-face conversation. The respondents of the research could be various people with various levels of educational background and culture. Since in this case study the data will be collected through interview, the author would treat a way and situation while doing in-depth interview. According to Denzim in Mulyana (2001), in-depth interview is one of nonstructural interview with the purpose to obtain certain information from all respondents, but the term that is used by the researcher should adjust to every respondent.

For instance, the researcher should differ the way to interview a manager from a worker. By that way, the sources could understand better what the questions mean are. Interviews took unstructured form. The unstructured interview uses ‘open-ended’ or ‘open’ questions and the questionnaire is often pitched at a very general level so that the interviewer can see in what direction the interview takes things in their response. Interviews were being to person who involve in construction site. It includes the workers, the contractor, the site engineer and other who are involved in the construction site. Safety problem at site construction will get from interviews.

3.2.4 Questionnaire Survey

A questionnaire is a set of questions put forth a person with an aim to get a response to it. The response serves as an input for further analysis and research. Questionnaire is defines as a formal set of question or statement designed together the information from respondents that will accomplish the goals of the research project (Redzuan, 2006). The questionnaire designed need to meet the objective and aim of the study. The design decisions depend on the purposes of the study, the nature of the problem, and the alternatives appropriate for its investigation (Stephen Issac, 1971).

Questionnaires were used to collect the general views of the construction professionals related to the causes of accident and the solution. Literature review and preliminary interview with the relevant professionals were considered in developing the questionnaire. To clarify the questionnaires interpretation, direct interview on respondents was carried out. Thus, the interpretation of the data could be accurate and broader.

Furthermore, the purposes of using questionnaire as a research instrument for survey are:

a) Respondents of this research are practitioners of construction industry that were selected from various parts; include workers and supervisors or managers. Assumed that all respondents are able to read and write and understand the questions and would not have problem to complete the questionnaire;

b) Using questionnaire could increase time and human resources efficiency. Time efficiency could be achieved for the researchers who do not have to interact directly with respondent. They could propose their question through questionnaire by explaining the direction of answering the questionnaire. While human resources efficiency could be achieved for the number of survey that needed to distribute the questionnaire could be minimized;

c) Using questionnaire could assist the respondent more to better understand the questions, because they have more time to think and to complete the questionnaire; and

d) Efficiency that created by using questionnaire enable us to increase the number of respondents of the research. Thus, we could achieve more accurate research and describe the whole population.

The nature of the response depends on whether the question is of open type or closed type. In a closed type question, there are multiple choices but in an open type question, there are do not provide respond choice and sensitive to the respondents desire for expression. The close-ended questions supply response choices and reduce in interpreter bias and easy to analysis. Dichotomous question are close-ended question that offer to response choices and suitable to understand the respondents demographic compassion (Redzuan, 2006).

Questionnaire implemented in this research is close-ended. This form of questionnaire gives respondent to response and reply questions freely. It is also required to explore additional information for further analysis. Questionnaires were sending to person who is involved in construction work such as the workers, the contractor, site engineer and others. This questionnaire will send by hand. Preparation question for questionnaire depends on literature review and site visit. Design the questionnaire need to be consider:

i. Determine the objective

ii. Decide the attributes to measure

iii. Identify the respondent

iv. Choose measurement scales

These questionnaires were doing to identify the critical cause's factor of fall accident and the solution in construction site. The survey questionnaire was designed in two main sections. Section A was about background of respondent such as location of company, position and experience. Section B was about the critical cause's factor of fall accident which can divide in to three parts, part 1 is unsafe attitude, part 2 is unsafe practice and for the part 3 is unsafe workplace condition. Section B was about the solution of the fall accident in the construction site also can divided in to three part which are part 1 is the good attitude, part 2 is the good practice and for the part 3 is the good workplace condition.

The causes factor of fall accident and the solution was based on a rating scale of 1 to 5 as below. This rating scale was developed based on rating scale implemented by Department of Occupational Safety and Health (DOSH) in evaluating the OSH-MS of Malaysian conventional civil construction sites.

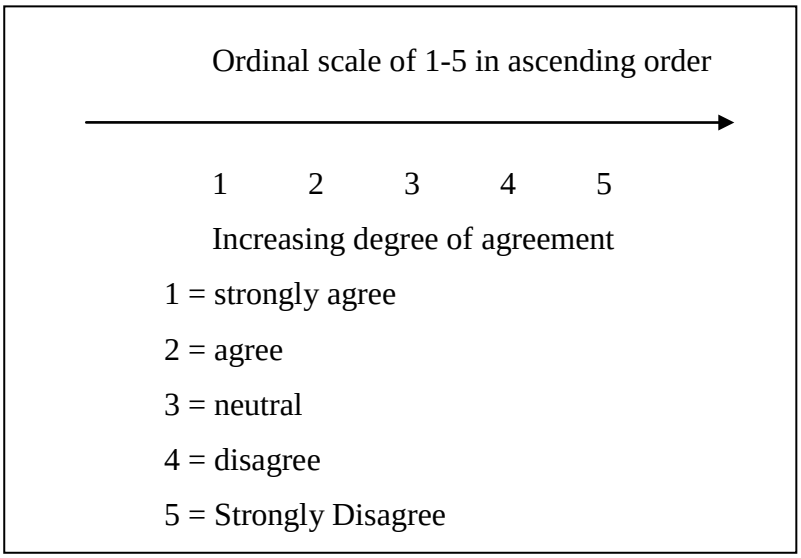

Figure 3.1: Five ordinal measures of agreement of method likert's scale

3.3 Data Collection

3.3.1 Method Distribution

The questionnaire had been prepared need to distribute to the respondent. There is a lot of method to distribute. The distribution method depends on the size and current communication channels of the organization or business group. It is up to the committee to decide on the best method and appropriate timing for distribution.

- Hand-to-hand distribution-by a team of volunteers (in the case of a single organization) or an employer's designated health representative (in the case of a business group) is best.

In this research, distribute by hand is the effective way and suitable with this study. It is because, the respondent only in the area of Kuala Lumpur and Kuantan,Pahang. Documents that are delivered personally are far more likely to receive attention than those simply sent through in-house mail channels or dropped anonymously at desks or work stations. Personal distribution also gives employees a chance to ask questions about the survey.

3.3.2 Data Analysis

Data analysis carried out the quantative data obtained from the questionnaire survey. A different statistic method such as frequency analysis and average index is the technique being analyze the data. Firstly, use the frequency analysis to get the frequently for every question and followed by average index to rank the questionnaire.

The discussions were mainly to evaluate the results obtained from the survey and rank the factors. The summary of the study then presented with the conclusion of the study, recommendation from the conclusion along with the recommendation for further studies in this area.

3.3.2.1 Frequency Analysis

The frequency analysis used to represent results of data analysis of the number of response that the respondent gives to different variables in the questionnaire. The result tabulated in the form of frequency number and percentage according to the total respondents. For graphic result presentation, pie chart and column graph is used as summary.

3.3.2.2 Average Index

In average index analysis, the results further summarized to obtain the level of importance in evaluating the factors, which involve in the survey on factor of fall accident and the solution in the construction. The questionnaires are based on five-point scale starting with 5 for strongly agree to 1 for strongly disagree.

The average index analysis for each variable can calculate by using formula by Al Hammed et al, 1996 as below:

$$\text{Average index (A.I)} = \frac{\sum aixi}{\sum xi}$$

Where,

ai = constant expressing the weight given i

xi = variable expressing the frequency of response for i = 1,2,3,4,4…….n

x1	=	number of respondent for strongly agree	for a_1=1
x2	=	number of respondent for agree	for a_2=2
x3	=	number of respondent for neutral	for a_3=3
x4	=	number of respondent for disagree	for a_4=4
x5	=	number of respondent for strongly disagree	for a_5=5

The overall level of agreement by the respondents to the safety which influences the critical causes factor of fall accident are summarized based on the classification of the rating scale which has been modified (Abd Majid & R. McCaffer, 1997). The classifications of the rating scale are as shown in Table 3.1:

Table 3.1: Modification of the level of agreement and evaluation for average index analysis, (Abd Majid & R. McCaffer, 1997)

Level of agreement of evaluation	Average index
Strongly disagree	**1.0≤ average index<1.5**
Disagree	**1.5≤ average index<2.5**
Neutral	**2.5≤average index<3.5**
Agree	**3.5≤average index<4.5**
Strongly Disagree	**4.5≤average index≤ 5.0**

3.4 Summary

In summary, the methodology described in this chapter would consistently answer the study of the objectives. The data obtained from the questionnaire was analyzed accordingly. Overall, besides identify the problem related with safety aspect in the construction site and identify the critical causes factor of fall accident, the data helped to remind the worker and employer to the precaution step.

In this chapter the usage frequency analysis and average index .Data collected from the questionnaire are analyzed using Average Index to obtain the ranks, and frequency analysis use to calculate percentage according to the total respondents. For graphic result presentation, pie chart and column graph is used as summary will be applied for the next chapter.

For the distribution method that applied before the data collections, distributions by hand is more effective than using mail or by post where the percentage of receiving is high. Finally after the analysis, safety practices, which are predominant, will be revealed according to construction experts.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter discussed on the analysis of the results from the questionnaires which were distributed to consultant, contractor and Public Work Department (PWD) around Kuala Lumpur and Kuantan. These questionnaires are important to identify the critical cause's factor of fall accident in construction site.

There were 60 set of questionnaires were distributed to the respondent, but only 41 set were answered. All the data from the questionnaire were analyzed by using frequency analysis, average index and percentage analysis. In Table 4.1 show the percentages of respondent rate. The percentage of answered questionnaire is 68.33% out of 100%.

Table 4.1: Percentages of "Respondents Rate"

No of sent out:	60 questionnaires
No of returned:	41 questionnaires
Response rate:	68.33%

4.2 Section A: Profile and Background of Respondent

The survey questionnaire was designed in three main sections. Section A based on their profile and background of respondents. Section B was about the critical cause's factor of fall accident and for the section C was about the solution of the fall accident in the construction site. Table 4.2 shows the percentage of 'Type of respondent's Company'. The data obtained from the set of questionnaire in section A. There are 25% of companies registered under the private sector and 43.33% of companies registered under government sector. Other than that, method of delivery for this survey is 100% by hand. This is because, distribute by hand is the effective way and suitable with this study which is located in the area of Selangor and Kuantan,Pahang. Personal distribution also gives employees a chance to ask any confusing related with this survey. Figure 4.1 shows the percentage of method of delivery.

Table 4.2: Percentage of "Type of company"

Type of Company	Frequency	Percentage
Private	15	25.00%
Government	26	43.33%
Total	41	68.33%

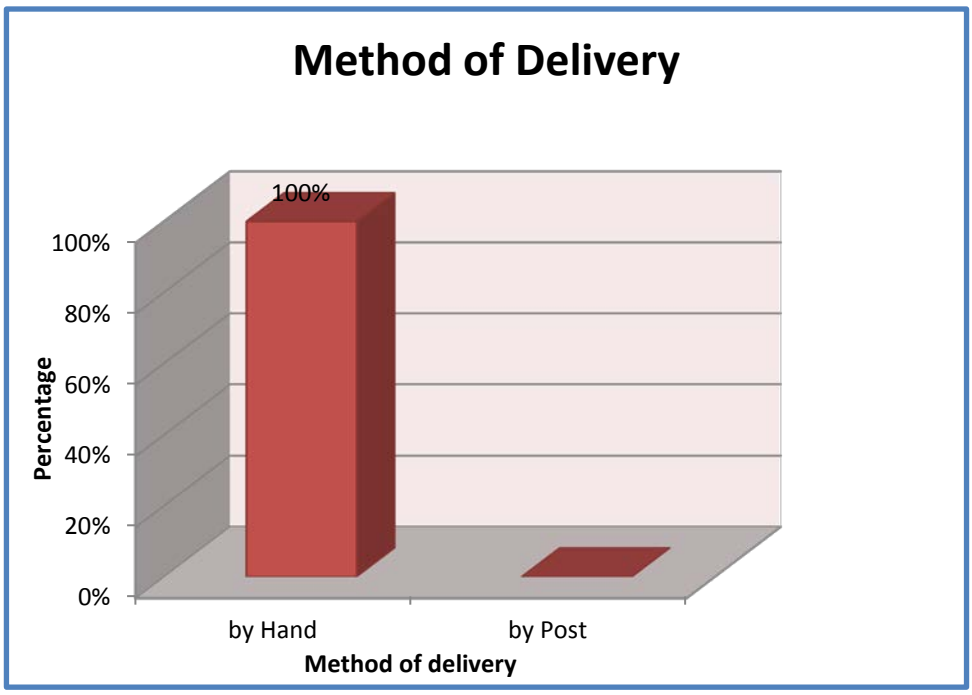

Figure 4.1: Method of Delivery

From the questionnaires in Section A, the respondent can be categorized according to their position in the company. Table 4.2 indicates the 41 respondent's background based on their position. Most respondents who answered questions are engineer. There are 29% out of 68.33%.It followed by contractor which is 24%. Clerk, supervisor and technicians included in other categorize which is 15%. Other than that, 12% of respondent are contractors. Lastly, Project manager and safety officer have same percentage which is 10%.

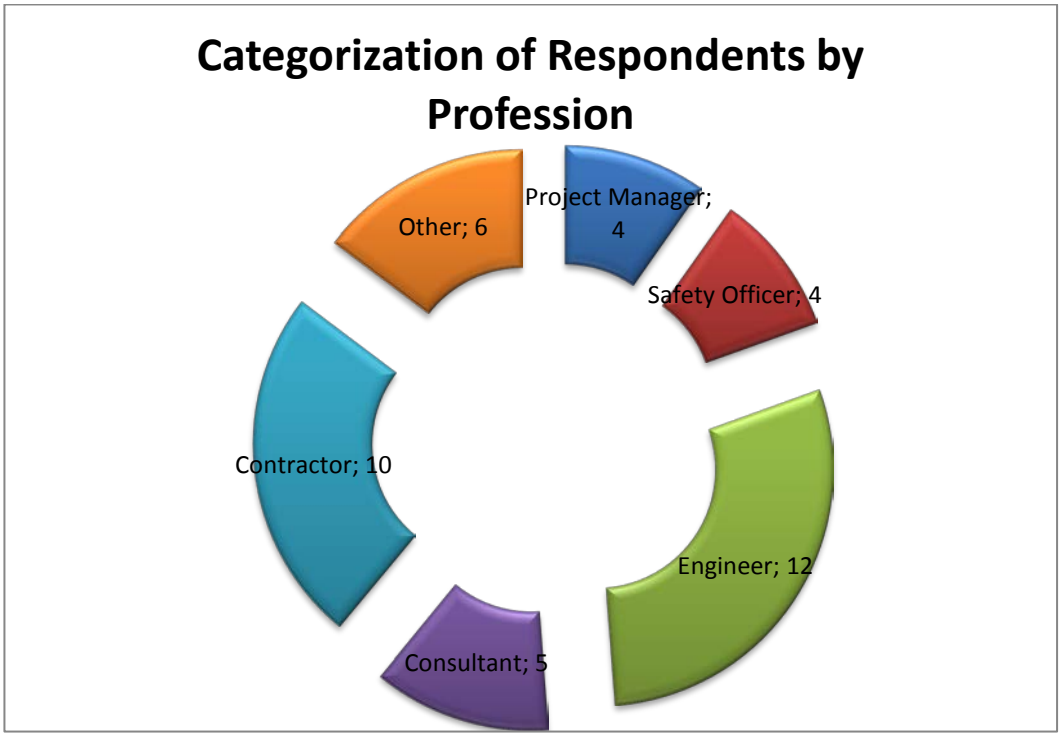

Figure 4.2: Indicator for "Categorization of Respondents by Profession"

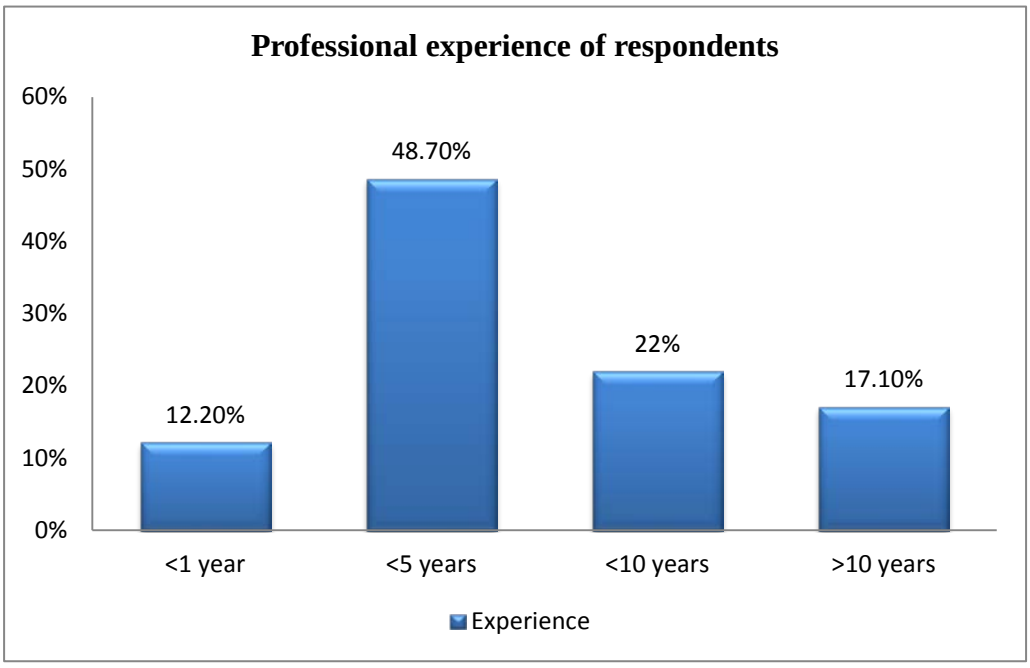

Figure 4.3: Indicator for "Professional Experience of respondent"

Figure 4.3 indicates the professional experience of respondent in construction industry. Majority of the respondents have experience less than 5 years. It is around 48.70%.Then, it followed by the respondent who have experience less than 10 years with percentage 22%.Other than that, 17.10% of respondent have more than 10years experience. They can also be classified as super senior and very professional in this field. The lowest percentage is 12.20% which is respondent who has less than 1 year experience.

4.3 Section B: Critical cause's factor of fall accident in construction site.

Fall accident can be happen influenced by a lot of factors. Some example of causes factor of fall accident are unsafe behavior, unsafe practice and unsafe workplace condition. Based on the analysis of the questionnaire survey, Table 4.3 shows the ranking of probability 'The most critical cause's factor of fall accident'.

Table 4.3: Ranking of Probability "The most critical cause's factor of fall accident"

The most critical causes factor of fall accident		Percent	Rank
1	Unsafe behavior	46%	1
2	Unsafe practice	34%	2
3	Unsafe condition	21%	3

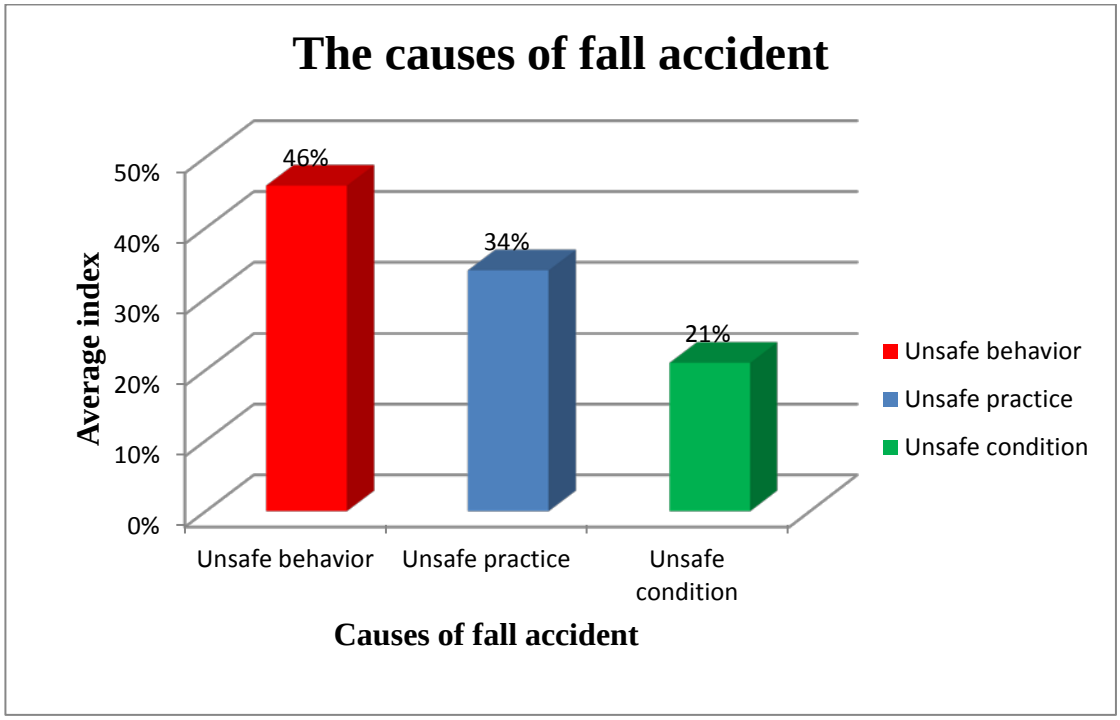

Figure 4.4: Indicator for "The most critical cause's factor of fall accident"

The survey identified the critical cause's factor of fall accident in construction site. Figure 4.3 indicated those respondents choose unsafe behavior as the major causes of fall accident. The percentage was 46%, followed by unsafe practice which 34% and 21% for unsafe condition.

Unsafe behavior is the first causes of fall accident. Unsafe behavior means that the negative individual attitudes that can influence the fall accident. Actually, accident can be avoided if every person has a good attitude. There are several example that can be categorize as unsafe behavior such as lack of teamwork spirit, working under influence alcohol and drug, hired the worker that do not have expertise and others.

Unsafe practice is one of the causes of fall accident. The meaning of unsafe practice is the practices of behavior that against the rule and regulation in construction site. The effects from the bad practices can causes of fall accident. There are some example of unsafe practice which are did not follow the proper method, did not wearing safety boot and body harness while work at the high place, playing with each other during work at the high place and etc.

Unsafe workplace condition is the last factors of fall accident.Unsafe condition consist of the condition at the surrounding of the construction site. Even it is ranking at the bottom, it does not mean, it is does not matter. Examples for unsafe workplace condition are guardrails are not provided in order to bring safety condition, ineffective housekeeping in the construction site after work and etc.

From the data analysis, unsafe behavior is the lead causes of fall accident. This is because in construction area is a restricted smoking area. There are some material are combustible materials and explosive such as wood, paint and others. Then, employees are under the influence of drugs and alcohols are prohibited to work revealed this construction site. It can be dangerous to themselves and the others. As a precautions step, project owners will send their employees to do a urine test to ensure the health of their employees.

As observed by Howell et al. (1998), unsafe practices are often seen in every construction project all over the world. As with other develop countries which are strict on their safety regulation, Malaysia’s government chooses to use its own regulations and laws. Although the regulations are strict, the unsafe practices still occur during construction period. This is because; the cause is related with humans or people. Human is difficult to predict. Even the company already provides the seminar, safety attire, but some of them will refuse to use it.

Besides that, contractor shall provide and maintain suitable personal protection equipment for all workers employed on the construction site. The contractor shall ensure that such personal protection equipment comply with requirement of the regulations. The contractor also should ensure that all equipment is properly used by his workmen during the course of their work. This is because, the workers only wear and use the safety attire when the safety officer come into the site and do the spot check. This is because, they do not want to be punished but if the safety officer goes out from the site , they will not the follow the rule and regulation.

Unsafe workplace conditions become the last factor because it is related with the surrounding. Housekeeping is compulsory task after done the work. Failure to ensure that the site is clean and free from hazards can lead to accidents. For example, if the site is muddy and slippery this may cause employees to slip, trip and then fall.Xinyu Huang and Jimmie Hinze (2003), also stated that removal of safety devices is also a leading cause of fall accident. In the other hand, the company usually orders the tools that have a full protection.

4.4 Analysis of critical causes factor of fall accident in construction site

The return questionnaire will be analysis by using Average Index formula. Using this formula, the value of average index (A.I) will obtain. By using this A.I,it can determine the level of agreement in Table 4.4.

Table 4.4: Modification of the level of agreement and evaluation for average index analysis, (Abd Majid & R. McCaffer, 1997)

Level of agreement of evaluation	Average index
Strongly agree	**1.0≤ average index<1.5**
Agree	**1.5≤ average index<2.5**
Neutral	**2.5≤average index<3.5**
Disagree	**3.5≤average index<4.5**
Strongly Disagree	**4.5≤average index≤ 5.0**

The critical cause's factors of fall accident are:-

i. Unsafe behavior
ii. Unsafe practice
iii. Unsafe workplace condition

This is the example how to calculate the average index.

Frequency can be obtain when count the number of respondent that agree the unsafe behavior either number 1,2,3,4 or 5. This process will continue until the last question. After the number of frequency will be substitute in this equation,

$$\text{Average index (A.I)} = \frac{\sum aixi}{\sum xi}$$

Unsafe behavior		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	The workers did not follow the rule in construction site such as did not wearing the personal protection equipment(PPE)	20	15	3	1	2	1.780	1

Where:

ai = the level of measurement

xi = number of respondent

This is the example how to get average index for unsafe behavior.

$$= \frac{(1 \times 20) + (2 \times 15) + (3 \times 3) + (4 \times 1) + (5 \times 2)}{(20+15+3+1+2)}$$

$$= 1.780$$

So, 1.780 is the average index (A.I) for workers did not follow the rule in construction site such as did not wearing the personal protection equipment (PPE). After calculate the A.I for every point, we can rank the point according the value of A.I. If the level of measurement start with number 1 is strongly agree, so, the smallest A.I value among this point will be number 1. It same with the rest.

4.4.1 Unsafe behavior in construction site.

Unsafe behavior can lead the fall accident. There are five worker behaviors that can be identified as causes of fall accident under unsafe behavior. All that unsafe behaviors were stated in Table 4.5 .In this part, all point were analyzed and the result shows in Table 4.5.

Table 4.5: Unsafe behavior in construction site

(1) Strongly Agree (2) Agree (3) Neutral (4) Disagree (5) Strongly Disagree

Unsafe behavior		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	The workers did not follow the rule in construction site such as did not wearing the personal protection equipment(PPE)	20	15	3	1	2	1.780	1
2	Lack of teamwork spirit among the workers and also among the management department	14	15	8	3	1	2.073	3
3	Hired the worker that have no expertise and experience	11	18	8	3	1	2.146	4
4	Lack of attention from the main contractor/project manager about personal protection equipment	20	14	4	0	3	1.829	2
5	Working under the influence of alcohol and taking drugs	18	10	5	5	3	2.146	5

Table 4.5 shows the majority respondents agreed on workers did not follow the rule in construction site such as did not wearing the personal protection equipment(PPE) with average index (AI) is 1.78. AI for lack of attention from the main contractor is 1.829. The last ranked is the worker work under influence alcohol and drug is 2.146. According to Mohamed Nazir Meraslam Sdn.Bhd (MNM) project and health plan, provide the PPE is compulsory to ensure where any foreseeable risk of injury can be reasonably prevented or reduced by the use of suitable protective equipment.

Other than that, lack of attention from the main contractor/project manager can be second unsafe behavior. Refer from project and health plan by Mohamed Nazir Meraslam Sdn.Bhd (MNM), the company stated that, project manager have a responsibility from the initial stage and as work programs, any hazardous work and takes appropriate measures to ensure that any risks are eliminated or adequately managed. Construction manager, safety and health officer/supervisor, site engineer and other also have a responsibility to avoid an accident from happen.

Besides, according to Occupational Health and Safety (OH&S) objectives, in supervisory level, all workers must be competent to carry out their task. Apart from that, some of respondent agree that, hired the worker that have no expertise and experience can be the unsafe behavior that can causes fall accident in construction site.

4.4.2 Unsafe practice in construction site.

Unsafe practice can be lead fall accident in construction site. There are five activities that can be categorized as unsafe practice. All this activity can be the causes of fall accident in construction site. Table 4.6 presented the analysis of unsafe practice in construction site.

Table 4.6: Unsafe practice in construction site

(1) Strongly Agree (2) Agree (3) Neutral (4) Disagree (5)Strongly Disagree

Unsafe practice		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	The workers do not follow the proper method when using the equipment	21	15	1	2	2	1.756	2
2	When work using the scaffolding, did not wearing a safety belt or body harness	23	12	3	1	2	1.707	1
3	Playing with each other during work at the high place	16	12	11	1	1	2.000	4
4	Failure to ensure that the site is clean and free from hazards	17	16	3	4	1	1.927	3
5	Did not do the inspection of the soil before built the scaffolding	13	17	5	4	2	2.146	5

Table 4.6 shows that respondent agree that, five activities stated can influence the fall accident. According to analysis between unsafe behavior, unsafe practice and unsafe workplace condition, unsafe practice is second highest evaluation. All about unsafe practice in construction site can be causes the fall accident. The highest ranging by using average index (A.I) for unsafe practice is when worked using the scaffolding but did not wearing a safety belt or body harness is 1.707. A.I for the workers does not follow the proper method when using the equipment is 1.756. Besides, when did not do the inspection of the soil before built the scaffolding is ranked last with A.I 2.146.

According from the Occupational Safety and Health (OS&H), when worker work using the scaffolds, they must where personal protection equipment (PPE) such as safety belt and body harness. Every employee engaged in work upon such roof is protected by safely harness/belt, life line or fall arrestor. This is because, working at height have a tendency to involve in fall accident. Other than that, workers do not follow the proper method when using the equipment can be causes of fall accident. For example, if worker want to go upstairs, they must use the ladder or platform has been provided, by taking the easy way, by climbing the scaffolds. The unsafe practice can causes a fall accident.

Based on Australian Safety and Compensation Council, when work using scaffolds, the important things is inspect the ground whether it is able to bear the load from scaffold or not. Employers must ensure that the relevant workers understand not to make any unauthorized alterations to the scaffold (such as removing guardrails, planks, ties, toe boards and braces) and make sure that working platforms need to be kept clear of debris and access obstructions along their length, and that incomplete or defective scaffolds must never be accessed.

4.4.3 Unsafe workplace condition in construction site

Pernama (2007), state that policy and safety procedure sometimes do not eliminate accidents but unsafe workplace condition could be the one that cause fall accidents to occur. In this set of questionnaire was asked whether unsafe workplace condition can influence the fall accident or not. All the data were analyzed and shown in Table 4.7.

Table 4.7: Unsafe workplace condition in construction site

(1) Strongly Agree 2) Agree (3) Neutral (4) Disagree (5)Strongly Disagree

Unsafe workplace condition		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	The guardrail are not provided in order to bring safety condition for workers that to their works at high level	15	16	6	2	2	2.024	3
2	Provide the defect tools and equipment for the worker	12	13	11	3	2	2.268	5
3	Ineffective housekeeping in the construction site after work.	14	17	7	2	1	2.000	2
4	Did not apply a net during working at the high place	17	16	5	3	0	1.854	1
5	Did not provide a ladder to the worker who work at the high place	13	13	10	3	2	2.220	4

Based on the table 4.7, average index (AI) for did not apply a net during working at the high place is 1.854. Other than that,A.I for ineffective housekeeping in the construction site after work is 2.000. Net must positioned while work at the high place to ensure that if any fall object or material can be retained to avoid current accident. According to Building Operation and Work of Engineering Construction, Regulation 1986, works at height shall be properly with safe access, scaffolds and working platforms with cover with net, wear safety harness/belt and secured.

In the other hand, did not provide the guardrail during work at the high place is the third rank which have average index (A.I) 2.024. Followed by A.I, 2.220 which is did not provide a ladder when work at the high level and the last is providing the defect tools and equipment for the worker with A.I, 2.268. Some of respondent agree that did not provide a ladder and guardrail can be causes of fall accident. According to Australian Safety and Compensation Council, Guardrails may be used to provide effective fall prevention at the edges of roofs and roof framing, the edges of scaffolds, the edges of work platforms, suspended slabs, formwork and false work, walkways, stairways, ramps and landings, the perimeters of buildings and other structures, the perimeters of skylights and other fragile roof material, openings in floor and roof structures, and the edges of shafts, pits and other excavations.

Other than that, to achieve Occupational Health and Safety (OH&S) plan, all workers must ensure all unsafe condition /unsafe acts are reported and rectified accordingly. After that, all work places/ area are safe and healthy by having a proper working platform, safe guarding and others. Through this plan, it can be prevent the fall accident from happen

4.5 Section C: Solution for the fall accident in construction site

There were three main factors to prevent fall accidents. There are good behavior, good practice and good workplace condition. These factors are more technical and related with management which is directly related with fall accident. The respondents give their opinion regarding the important of three factor of solution for fall accident.

4.5.1 Good Behavior is the solution for fall accident

There were five activities can be identified as the solution for fall accident under good behavior in construction site. All the result were analyzed and shown in Table 4.8.

Table 4.8: Good behavior that can solve the fall accident

(1) Strongly Agree (2) Agree (3) Neutral (4) Disagree (5)Strongly Disagree

Good Behavior		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	Build the teamwork spirit among the workers	18	16	5	2	0	1.780	3
2	Always remind the worker to wear PPE during in the construction site	23	12	3	0	3	1.732	2
3	Provide the worker go to the training related with safety and the right way to handle to tools and equipment	27	10	1	0	3	1.585	1
4	Always do the tool box meeting before start the work daily.	16	19	4	0	2	1.854	4
5	Conduct health checking for the worker to know their level of healthy	13	19	6	2	1	2.000	5

Table 4.8 shows that, good behavior's factor can be one of the solutions to prevent fall accident from happen. The highest rankings for providing the worker go to the training related with safety and the right way to handle to tools and equipment. The average index (A.I) is 1.585. Besides, always remind the worker to wear PPE during in the construction site is rank in the second place with A.I 1.732 and for the last rank is 2.000 refer to conduct health checking for the worker to know their level of healthy

According Occupational Health and Safety (OH&S) plan, Mohamed Nazir Meraslam Sdn.Bhd (MNM) want to achieve (OH&S) objectives and target which is create 'Accident Free Operation' (Zero Accident) in construction site.MNM at supervisory level provide all the workers equipped with proper personal protection equipment (PPE), all workers must attend the toolbox meeting before commencing the work and also built the teamwork spirit among the worker.

All project staff and workers include sub-contractor's worker are to be trained and competent to perform the task to achieve higher standard according to Occupational Health and Safety (OH&S) procedures. OH&S would be consulted and communicated through:-

I. Safety and Health Committee meeting
II. Hazard Identification and Risk Assessment
III. Toolbox Talks
IV. Induction/Briefing/Training
V. Safe Work Instruction
VI. OH&S

4.5.2 Good practice is the solution for fall accident

Good practice can be lead as solutions of fall accident in construction site. There are five activities to minimize the number of fall accident under good practice. Table 4.8 presented the analyzed of good practice in construction site.

Table 4.9: Good practice that can solve the fall accident

(1) Strongly Agree (2) Agree (3) Neutral (4) Disagree (5)Strongly Disagree

Good practice		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	Wearing a mask during handling the painting work	18	15	6	2	0	1.805	3
2	Provide the short and simple path to the worker to walk from the one level to the another level	14	14	10	3	0	2.049	4
3	Increase safety inspection in construction site	22	13	3	3	0	1.683	1
4	Knowing about past accident can be helpful to be a preventive solution	15	14	8	3	1	2.049	5
5	Apply the rule and regulation, if the worker did not follow it, give them a punishment.	23	11	4	2	1	1.707	2

Table 4.9 shows the activities that can be the solution of fall accident in good practice. The highest ranking for good practice is the increase safety inspection in construction site is 1.683. Apply the rule and regulation, if the worker did not follow it, give them a punishment is rank number 2 with average index (A.I) 1.707.The A.I for last rank of good practice which knowing about past accident can be helpful to be a preventive solution is 2.049.by applying good practice, it can be the solution of fall accident in construction site.

According to the Occupational Health and Safety (OH&S), all workers must have a good practice. For an example, all workers must ensure that all work areas, machine/equipment are inspected daily, monthly or ad hoc inspection. It is same with Pembinaan Mohamed Nazir Meraslam Sdn.Bhd,the company manage and supervisory personnel and its sub-contractors are required to carry out continuous health and safety surveillance as they go they day-to-day business and take immediate steps to remedy any defect or unsafe practice observed. If defect are identified during inspection, a follow-up inspection will be carried out after a reasonable time to ensure defects have been promptly and satisfactorily remedied.

Other than that, the employees have a responsible to inform all the workers about emergency response plan (ERP). In any emergency situation, the primary objective and responsibility of all personnel concerned shall be safeguard life followed by property. The must obstacle in managing and the emergency situation is panic. So, if the workers know what to do, where to go and give relevant information and procedure applicable to an emergency, so, they can face this problem without panic. As a result, with a good practice like that, can minimize the fall accident from happen and all the workers are always be aware.

4.5.3 Good workplace condition is the solution for fall accident

Apart from good behavior and good practice, good workplace condition also can be the solution of fall accident. There are five attitude can be the precaution step to reduce the tendency to fall accident from happen. All the data were analyzed and shown in Table 4.10.

Table 4.10: Good workplace condition that can solve the fall accident

(1) Strongly Agree (2) Agree (3) Neutral (4) Disagree (5)Strongly Disagree

Good workplace condition		Frequency Analysis					Average index(AI)	Rank
		1	2	3	4	5		
1	Provide the new personal protection equipment to the workers	18	12	9	2	0	1.854	4
2	Always ensure the PPE in a good condition	25	12	2	1	1	1.561	2
3	After completed the work, do the housekeeping. All the tool and equipment put it at the actual place.	22	14	2	2	1	1.683	3
4	Apply the net during work at the high place to avoid the object to fall down.	24	14	1	2	0	1.537	1
5	Provide a ladder to the worker who work at the high place	19	13	6	2	1	1.878	5

Table 4.10 shows the five attitudes can lead the solutions for fall accident. The highest ranking for good workplace condition is applying the net during work at the high place to avoid the object to fall down with average index (A.I) is 1.537. According to the Australian Safety and Compensation Council, the most effective way of protecting the safety of workers during work at the high place is apply the net around the high level work.

Average index (A.I) for always ensures the PPE in a good condition is 1.561.It is at the second place. There are already mention in Project Safety and Health plan of Pembinaan Mohammed Nazir meraslam Sdn.Bhd.All personnel shall be informed at the time of issues, of the need to maintain the equipment properly and hygienically and to report immediately and defect or damage of the personal protection equipment.

Other than that,Pembinaan Mohammed Nazir Meraslam also apply general safe operating procedure (SOP) to achieve the Occupational Health and Safety (OH&S) objective. Proper housekeeping is a fundamental and necessary activity. It is basic requirement to eliminate accidents and improve efficiency. It has to start from the early stage of the construction and it is responsibility of every person working on the construction site. Example for the housekeeping are work areas, passageways and stairways shall be kept free of debris and materials, storage areas shall be kept clean and materials neatly stacked or placed, construction materials shall be stored or placed in an orderly manner, and others.

Furthermore, worker also must know about ladder criteria. Every ladder and stepladder shall be of good construction, sound material and adequate strength for the purpose for which it is used. When applies all the good workplace condition, it can minimize the potential to fall accident from happen.

4.6 Summary

In the questionnaire, the critical cause's factor and the solution of fall accident in construction site were identified .All respondents having their own opinion. They gave their opinion based on their knowledge and experience. There are three factor of fall accident in construction site which are unsafe behavior, unsafe practice and unsafe workplace condition. Solutions of fall accident in construction site are good behavior, good practice and good workplace condition. Unsafe behavior is one of the causes of fall accident in construction site. From analysis, it shows unsafe behavior in first ranked. The workers did not follow the rule in construction site such as did not wearing the personal protection equipment (PPE) is one of the unsafe behavior can be cause fall accident. Other than that, unsafe practice is the second causes of fall accident. This is because the workers still not apply a good practice in construction site such as did not wearing a safety belt or body harness during work using the scaffolding, Other than that, the workers still not practices and still not consider use personal protective equipment during installation process. The workers are required to apply good practice to be sure can minimize the number of fall accident in the construction site.

Unsafe workplace condition also factor of fall accident. Did not apply a net during working at the high place is one of the unsafe workplace condition. It also stated in Project Safety and Health Plan that the safety and health committee is not "responsible for" workplace safety and health. It is the duty of employees to take responsible care of the safety and health of themselves and other on site. When the entire person who involved in construction project can be a team, all problems can be solving such as fall accident. Provide the worker go to the training related with safety and the right way to handle to tools and equipment is one of the solutions of fall accident in construction site under good behavior. Good practice among the worker can minimize number of fall accident such as increase safety inspection in construction site. Lastly, apply the net during work at the high place to avoid the object to fall down is one of the good workplace condition in construction site. Therefore, identify the critical cause's factor and the solution of fall accident in construction site and ranking the causes and the solution were determined.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter will summarizes al the study works discussed in previous chapters. It showed the achievement for study objectives whereas to investigate the safety problem in construction site especially who work at the high place, to identifies the factor of cause fall accident in construction site and the solution and to analysis the factor that influences the accident and the precaution steps. This chapter will begin with the limitations of the study and followed by discussion of finding and after that, the conclusions and the recommendations for the causes of fall accident in construction site. Unsafe workplace condition was related with condition at the surrounding of the construction site.

5.2 Limitation of Study

Questionnaire were distributed to the government department such as Public Work Department(PWD) and some of private company such as MNM Cons. Sdn. Bhd. All the company target were located around Kuala Lumpur and Kuantan, Pahang. Questionnaires were distributed by hand but unfortunately not all respondent gave their feedback. At the beginning, 60 set of questionnaire were prepared and given to the company but only 41 set of them gave feedback. Besides that, not all of respondent gave a full corporation because of their responsibility with their works. However, with the received questionnaires from the respondents, the objectives this study were achieved.

5.3 Conclusion

As mentioned earlier, this study focused on the critical cause's factor of fall accident in construction site. The causes of fall accident were due to 3 factors that were unsafe behavior, unsafe practice and unsafe workplace condition. From the analysis, it could be concluded the most critical cause's factor of fall accident is unsafe behavior. Unsafe behavior means that the negative individual attitudes that can influence the fall accident. The workers did not follow the rule in construction site such as did not wearing the personal protection equipment (PPE) was one of the example for unsafe behavior. Unsafe practice was the second causes of fall accident. The meaning of unsafe practice is the practices of behavior that against the rule and regulation in construction site. Example for unsafe practice was when work using the scaffolding, did not wearing a safety belt or body harness. Unsafe workplace condition was the third causes of fall accident. Did not apply a net during working at the high place was one of the unsafe workplace condition.

The effective strategies to prevent the fall accident in construction site were consisting of three factors that were good behavior, good practice and good workplace condition. Provide the worker go to the training related with safety and the right way to handle to tools and equipment is one of the solutions of fall accident in construction site under good behavior. Good practice among the worker can minimize number of fall accident such as increase safety inspection in construction site. Lastly, apply the net during work at the high place to avoid the object to fall down is one of the good workplace condition in construction site.

5.4 Recommendations

The following are the recommendations highlighted for further study in order to identify the cause's factor of fall accident in construction site.

- Further studies shall be conducted focusing in many accidents in construction site, not only fall accident. This is because, in construction site, there are very dangerous place and everyone have a tendency to involve in accident.
- Focus in one department such as Public Work Department (PWD).This is because, in PWD, it has a lot of department such as Road Work, Structure, and Architecture. Those entire departments are related with construction site. By focusing in one department, it makes easily to study in detail about that department.
- Gather more respondents to get a more precise answer / opinion. For example, expand the location to distribute the questionnaire.

- Do a research by involving many parties such as Hospital, Police Station and others. It can give more detail data and evidence. This is because, when any accidents happen in construction site, the company will reported to the Police Station.
- Minimize the interview session. Construction Company will try to seek their problem especially related with accident such as death. This is because; they want to maintain their reputations.

5.5 Summary

Fall accident is very common during construction project. Construction site is dangerous place compare to the person who works in the office. When accident happens, many problems will obtain. For an example, the construction needs to stop immediately because of inspection session. It can influence cost of the project. Direct and indirect cost can decrease the profit of the company. All the bad attitude like unsafe behavior, unsafe practice and unsafe condition workplace can be eliminating when all of people involve in that project can give a full commitment. It is hoped through this study, it could be increasing the level awareness of workers and employees and also try to minimize the number of fall accident in construction site.

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APPENDIX A

(Questionnaire on the Critical Causes Factor of Fall Accident in Construction Site)

APPENDIX B

(Approval Letter from UMP)